



US006339404B1

(12) **United States Patent**
Johnson et al.

(10) **Patent No.:** **US 6,339,404 B1**
(45) **Date of Patent:** **Jan. 15, 2002**

(54) **DIVERSITY ANTENNA SYSTEM FOR LAN COMMUNICATION SYSTEM**

(75) **Inventors:** **Greg Johnson, Aptos, CA (US); Don Kellen, Sparks, NV (US)**

(73) **Assignee:** **Rangestar Wireless, Inc., Aptos, CA (US)**

(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) **Appl. No.:** **09/637,301**

(22) **Filed:** **Aug. 11, 2000**

Related U.S. Application Data

(60) **Provisional application No. 60/148,909, filed on Aug. 13, 1999.**

(51) **Int. Cl.⁷** **H01Q 21/00**

(52) **U.S. Cl.** **343/794; 343/702; 343/700 MS**

(58) **Field of Search** **343/700 MS, 702, 343/793, 794, 795, 820, 822, 846, 810**

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,138,684 A	2/1979	Kerr	343/846
4,356,492 A	10/1982	Kaloi	343/700
5,386,215 A	1/1995	Brown	343/795
5,557,293 A	9/1996	McCoy et al.	343/867
5,625,371 A	4/1997	Miller et al.	343/867
5,657,028 A	8/1997	Sanad	343/700
5,680,144 A	10/1997	Sanad	343/700
5,680,438 A	10/1997	Beesley	379/58
5,742,258 A	4/1998	Kumpfbeck et al.	343/795
5,754,145 A	5/1998	Evans	343/795

5,757,333 A	5/1998	Kitchener	343/826
5,767,812 A	6/1998	Basciano et al.	343/722
5,867,130 A	2/1999	Tay et al.	343/795
5,933,115 A	8/1999	Faraone et al.	343/700
6,031,503 A	2/2000	Preiss, II et al.	343/770

FOREIGN PATENT DOCUMENTS

WO	96/37922	11/1996	H01Q/3/32
WO	98/34295	8/1998	H01Q/21/06
WO	99/03168	1/1999	H01Q/1/24
WO	99/05754	2/1999	H01Q/21/06
WO	99/31757	6/1999	H01Q/1/38

Primary Examiner—Don Wong

Assistant Examiner—Shih-Chao Chen

(74) **Attorney, Agent, or Firm**—Fulbright & Jaworski L.L.P.

(57) **ABSTRACT**

A diversity antenna structure for a wireless communication device for receiving and transmitting communication signals is provided. The antenna structure including a dielectric substrate defining a pair of major surfaces and having a conductive reflector element disposed upon one of the major surfaces of the dielectric substrate, said reflector element being operatively coupled to a pair of shield conductors of coax feedlines. The antenna further including a plurality of serpentine radiator elements conductively coupled to the reflector element. The antenna assembly also including a pair of transmission lines disposed upon the other major surface of the dielectric substrate substantially opposite the reflector element, each of the pair of transmission lines coupled to one of the center conductors of the coax feedlines, and a pair of conductive balun structures disposed upon the dielectric substrate and coupled to the pair of transmission lines, the baluns being disposed substantially opposite the plurality of serpentine radiators.

17 Claims, 4 Drawing Sheets

